Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/AU05/001192

International filing date: 09 August 2005 (09.08.2005)

Document type: Certified copy of priority document

Document details: Country/Office: AU
Number: 2004904500
Filing date: 09 August 2004 (09.08.2004)

Date of receipt at the International Bureau: 30 August 2005 (30.08.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

Australian Government

Patent Office
Canberra

I, LEANNE MYNOTT, MANAGER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004904500 for a patent by TERRY DAVID INGRAM as filed on 09 August 2004.

WITNESS my hand this
Twenty-third day of August 2005

LEANNE MYNOTT
MANAGER EXAMINATION SUPPORT
AND SALES

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

TERRY DAVID INGRAM

Invention Title:

AIR-CONDITIONING UNIT

The invention is described in the following statement:

Air-conditioning Unit

This invention relates to an air-conditioning unit particularly for use with motor vehicles.

There are many situations with motor vehicles where there is a need for air-conditioning. In motor sport, safety requirements dictate that drivers have to wear fire resistant clothing and crash helmets. The design of the motor vehicles and their operating conditions is such that it is not unusual for drivers to have to operate the vehicles for lengthy periods at temperatures in excess of 50°C. Driving a car at high speed at these temperatures is a physically demanding exercise and there have been a number of suggested means of cooling the driver. One such suggestion is to provide a source of cool air that is fed into the helmet of the driver or into the driver's safety suit to cool down the driver when the operating temperatures become excessive.

Conventional air-conditioning units for vehicles incorporate a compressor that is usually driven from the engine of the vehicle. The compressor is bulky and uses a considerable amount of power from the vehicle's engine. In high performance racing cars there is neither the space nor the excess power to allow the engine to be used to power an air-conditioning unit.

There are other situations both with regard to motor vehicles and aircraft where there is a need for a small, compact and low powered air-conditioning unit that is not dependant on the engine of the vehicle to operate.

It is these issues that have brought about the present invention.

In accordance with one aspect of the present invention there is provided an air-conditioning unit comprising an evaporator, a condenser and a compressor coupled in a closed circuit to cycle a refrigerant characterised in that the compressor is powered by a 12 volt DC electric motor.

Preferably, the evaporator includes a blower that is driven by a second 12 volt DC electric motor.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a perspective view of an air-conditioning unit viewed from one side,

Figure 2 is a perspective view of the unit viewed from the opposite side,

Figures 3A, 3B and 3C are side elevational views of components of a compressor forming part of the unit, and

Figure 4 is a perspective view of an electric motor used to drive the compressor of the unit.

The air-conditioning unit 10 described in the accompanying drawings is designed to be positioned in the floor of a V8 Super Car, that is a V8 saloon car that has been modified for track racing. The air-conditioning unit is specifically designed to be small so that the whole unit fits on a tray 11 that measures 380mm by 290mm with the unit extending upwardly to a height of about 250mm.

As shown in Figures 1 and 2, the air-conditioning unit 10 comprises an evaporator 20 that is coupled to a compressor 30 through a TX valve 31 to a condenser 40. The condenser 40 is fed from the high pressure end of the compressor 30 and the base or outlet 41 of the condenser 40 is coupled to the evaporator 20 through a drier 42. The TX valve 31 controls both the input and output of the

evaporator 20 with the input in fluid communication with the compressor 30. The air-conditioning unit defines a closed circuit that cycles a suitable refrigerant which on compression in the compressor, and then expansion, draws heat from the atmosphere to provide an output of cool air that is drawn from the rear of the evaporator by a blower and blower duct 21. A source of fresh air is applied to the evaporator 20 and the rear of the evaporator 20 is enclosed by a shroud 25 that is in turn coupled to an electric motor (not shown) that drives the blower 22. The rear of the blower duct 21 includes a granulated carbon filter (not shown) and provide an output and a source of cool air which can then be fed to the helmet or driving suit of the driver of the V8 Super Car. The blower 22, compressor 30 and condenser fan (not shown) are all driven by 12 volt DC electric motors and the power for these motors can come from the electrical power of the vehicle that is produced by the alternator that is in turn driven by the engine.

In order to be run by a 12 volt DC motor, the compressor must be small and very efficient. The compressor 30 as shown in detail in Figures 3A, 3B and 3C and comprises a single reciprocating piston 60 that is driven by a crank shaft 61. The crank shaft 61 is coupled via a flexible coupling to an electric motor 70 shown in Figure 4. The piston head 62 is secured to the piston rod 63 by a gudgeon pin 64 and the head 62 carries suitable piston ring 65. The piston has a 0.9 inch diameter and the length of the piston is about 65mm. The crank shaft 61 is located in a crank case 66 by a bearing 67 and the piston 60 reciprocates in a stainless steel cylinder 68 that is covered by a head 69. The head 69 includes two stainless steel reed valves (not shown) each mounted on an inlet (not shown) and outlet port 72. When the reed valves are shut the compressor sucks in refrigerant from

the TX valve and when the reed valves are open the compressed refrigerant is discharged to the condenser 40.

It is understood that the stroke and bore of the piston may vary. The compressor is very small but operates at high pressures up to 150psi. It is a totally sealed unit that runs at between 1500 and 4000rpm. The crankcase 66 of the compressor 30 is pressured by refrigerant at low pressure via a branch line 73 from the TX valve 31 to reduce the pressure difference an opposite sides of the piston head 62.

The electric motor 70 that drives the crankshaft 61 of the compressor 30 is shown in Figure 4 and the motor that drives the fan for the evaporator 20 and blower 22 are rare earth motors that can have speed varying controllers mounted thereon.

The air-conditioning unit 10 described above is designed to drop the air temperature by about 15°C and is adjusted to operate in this range. The use of 12 volt DC motors operate at approximately 9amps which means that the air-conditioning unit 10 consumes about 108W of power. It is envisaged to reduce the current usage down to 4.5amps which would half the power consumption.

Although in the preferred embodiment the air-conditioning unit 10 is mounted so that the evaporator 20 and condenser 40 are mounted on opposite ends of the plate 11 with the electric motor 70 and compressor 30 supported therebetween, it is understood that the componentry could be spread around a vehicle or aircraft and coupled by suitable flexible hose. In this way the unit could be designed to take up a minimum amount of space. The high pressure line from the condenser 40 to the TX valve 31 is via a sight glass 75 and combined filter and drier 76.

The filter adjacent the blower 22 can be used to restrict the airflow down to the desired rate of 2L per second.

It is further understood that the air-conditioning unit can be coupled to a data logger, that is a system that monitors the data in the V8 touring car to measure temperature, humidity and other related parameters.

It is envisaged that the unit would be directly coupled to the helmet and driving suit of a V8 touring car. The use of filters to filer out dangerous gases such as carbon monoxide leaves the driver fresh and clear headed to ensure optimum driving performance.

Dated this 9th day of August 2004
TERRY DAVID INGRAM
By their Patent Attorneys
GRIFFITH HACK
Fellows Institute of Patent and
Trade Mark Attorneys of Australia

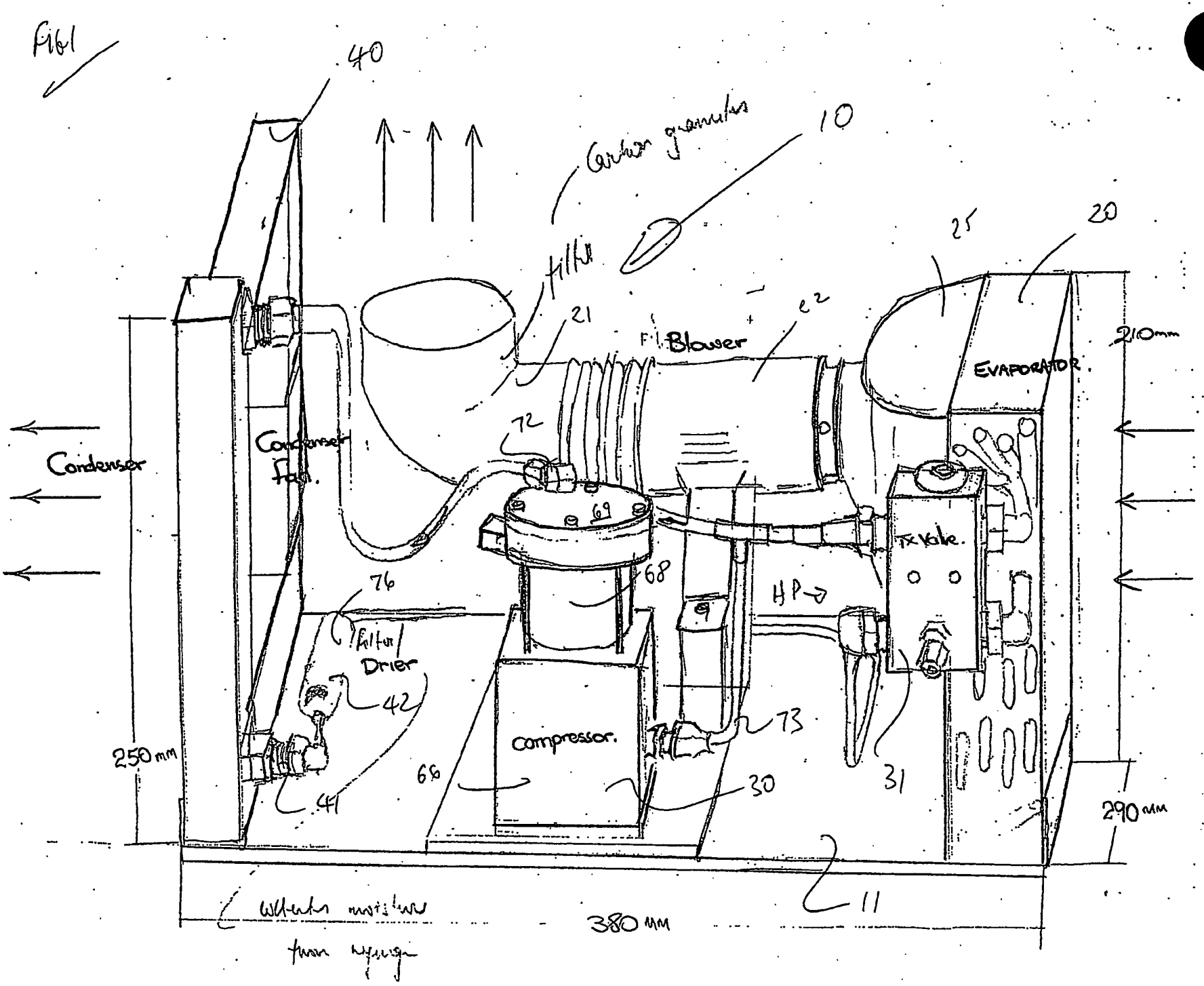
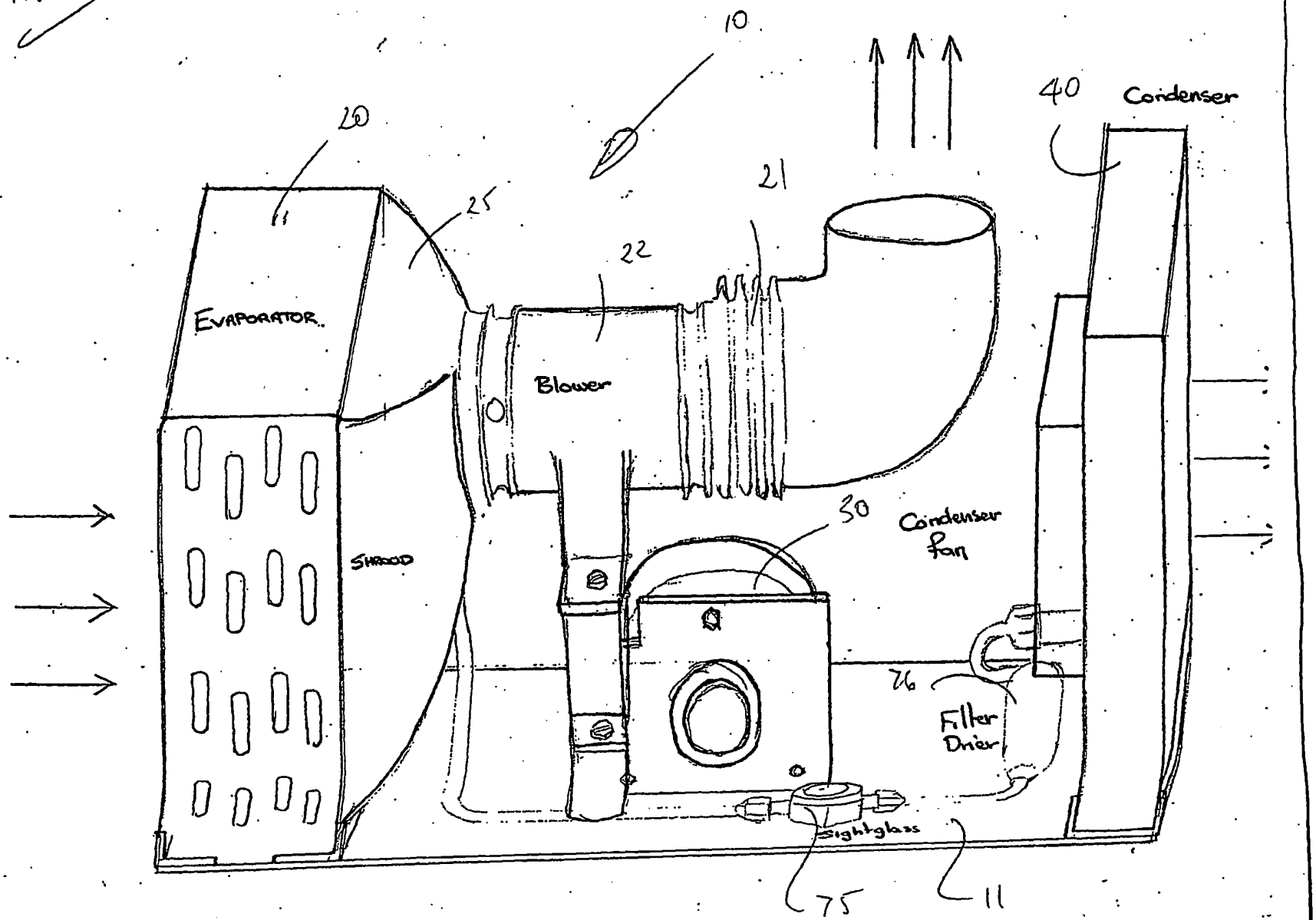


Fig1
40
10
Carbon granules
filter
21
Blower
22
25
20
210mm
EVAPORATOR
Condenser
Condenser fan.
72
69
TX Valve.
68
HP→
76
Filter/ Drier
42
41
250mm
compressor.
73
66
30
31
290mm
11
380mm

FIG 2


10
20
25
21
22
40
Condenser
EVAPORATOR
Blower
SHROUD
30
Condenser fan
26
Filter Drier
Sightglass
75
11

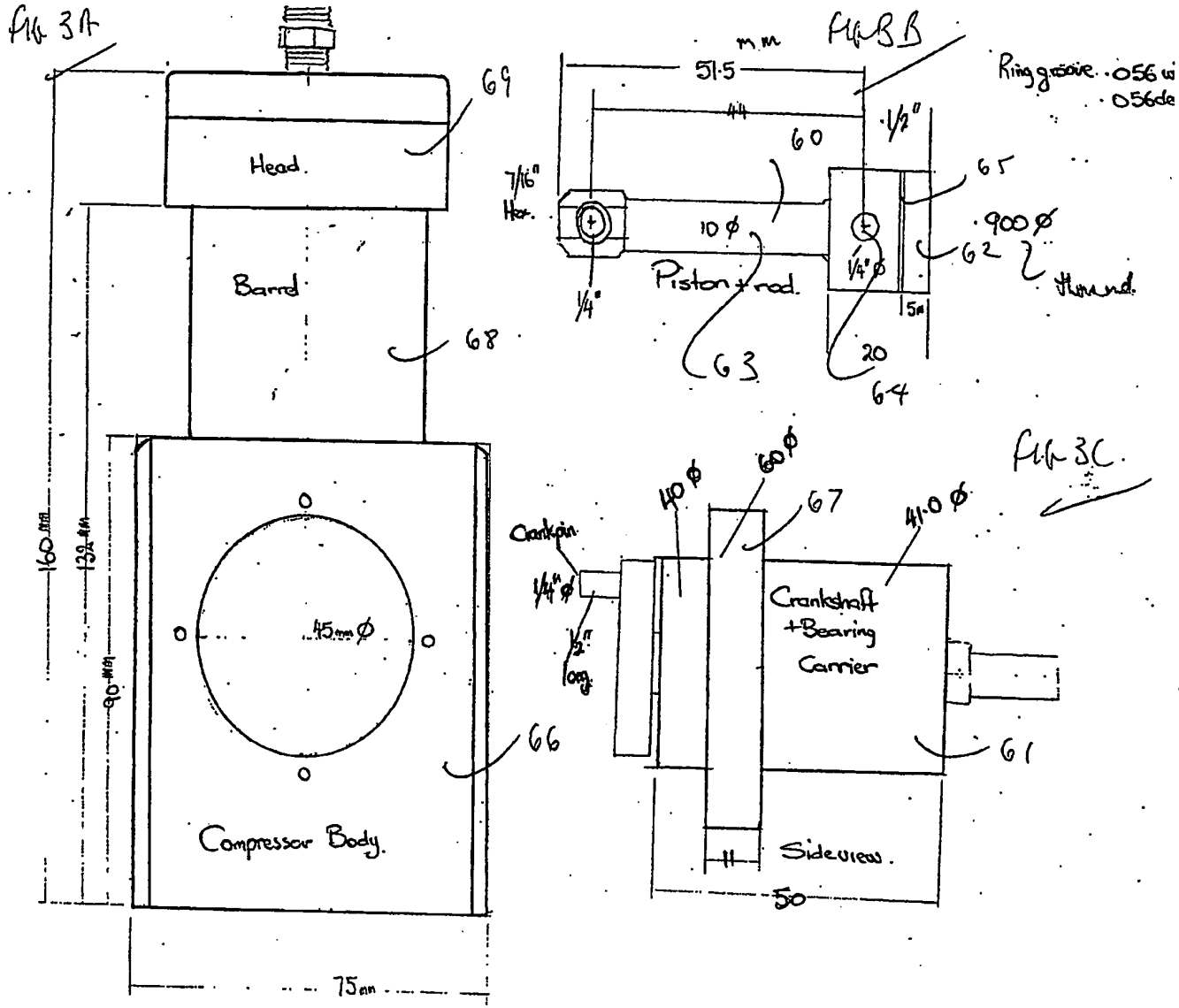
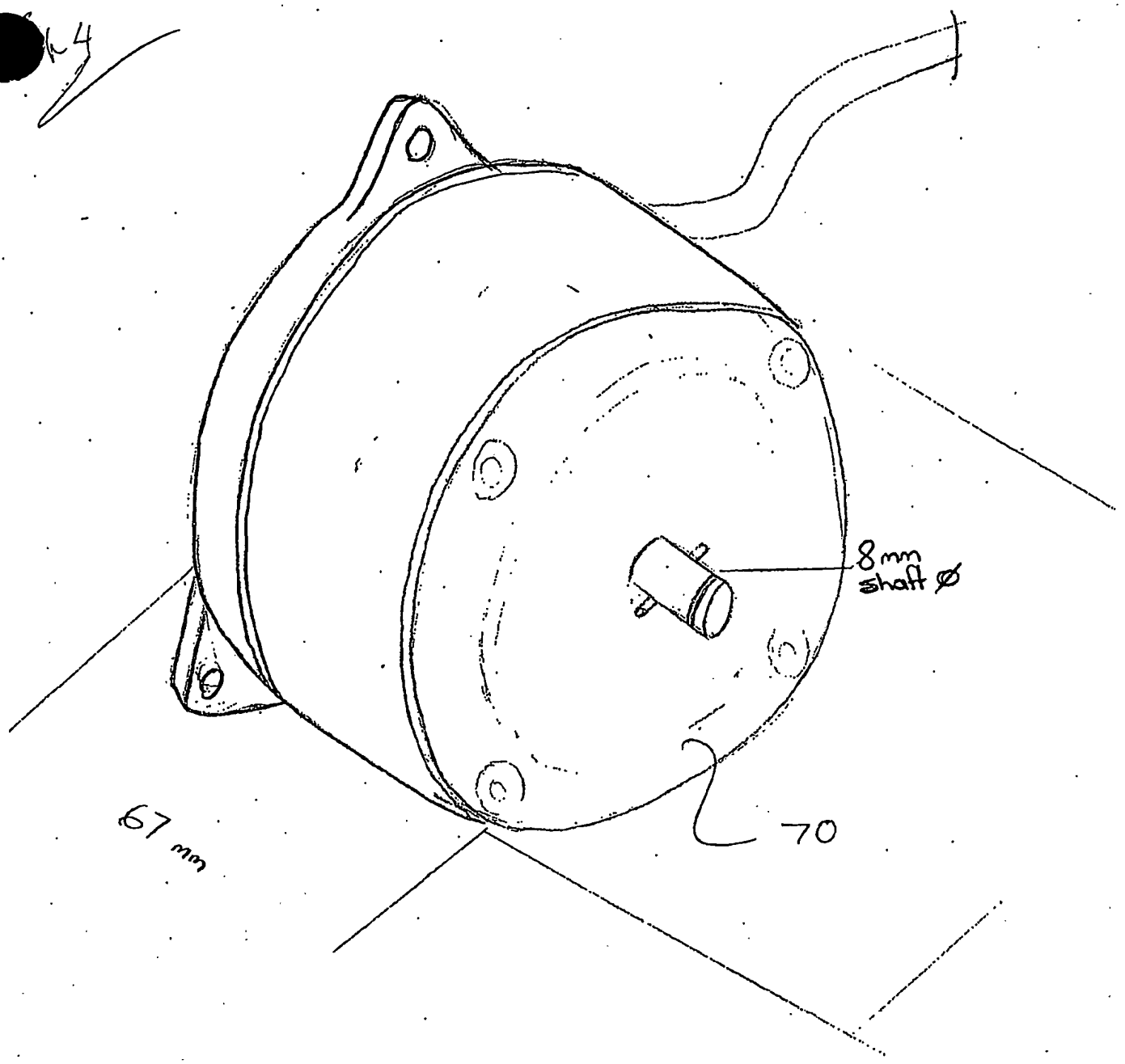


Fig 3A
Head.
69
Barrel
68
160 mm
132 mm
90 mm
45mm ø
66
Compressor Body.
75mm
Fig 3B
m.m
51.5
44
60
1/2"
7/16" Hex.
10 ø
1/4"
Piston + rod.
63
65
.900 ø
62
2 Required.
1/4" ø
5m
20
64
Ring groove .056 wide .056 deep
Fig 3C
40 ø
60 ø
67
41.0 ø
Crankpin
1/4" ø
1/2" long
Crankshaft + Bearing Carrier
61
11
Sideview.
50


8 mm
shaft ⌀
67 mm
70